GEORGIA INSTITUTE OF TECHNOLOGY OFFICE OF CONTRACT ADMINISTRATION

# PROJECT ADMINISTRATION DATA SHEET

[X] ORIGINAL [ ] REVISION NO. _____

Project No. A-3450 GTRI/~~GTX~~ DATE 1/18/83

Project Director: William M. Ewing ~~XXXXX~~/Lab EDL/SHD

Sponsor: City of Greenville, South Carolina

Type Agreement: Purchase Order No. 290706 and Standard Agreement No. A-3450

Award Period: From 1/5/83 To 2/28/83 (Performance) 2/28/83 (Reports)

Sponsor Amount: Total Estimated: $ 1,800 Funded: $ 1,800

Cost Sharing Amount: $ _____ Cost Sharing No: _____

Title: Air Sampling, City of Greenville, South Carolina

## ADMINISTRATIVE DATA

OCA Contact Faith G. Costello

1) Sponsor Technical Contact:

Carl H. Burkhart
Maintenance Administrator
City of Greenville, South Carolina
P.O. Box 2207
Greenville, SC 29602

2) Sponsor Admin/Contractual Matters:

Carl H. Burkhart
Maintenance Administrator
City of Greenville, South Carolina
P.O. Box 2207
Greenville, SC 29602

Defense Priority Rating: _____

Military Security Classification: _____

(or) Company/Industrial Proprietary: _____

## RESTRICTIONS

See Attached _____ Supplemental Information Sheet for Additional Requirements.

Travel: Foreign travel must have prior approval – Contact OCA in each case. Domestic travel requires sponsor approval where total will exceed greater of $500 or 125% of approved proposal budget category.

Equipment: Title vests with Sponsor; however, none proposed

## COMMENTS:

## COPIES TO:

Research Administrative Network
Research Property Management
Accounting
Procurement/EES Supply Services
Research Security Services
~~Reports Coordinator (OCA)~~
GTRI
Library
Research Communications (2)
Project File
Other William M. Ewing
Other _____

FORM OCA 4:781 (Rev 982)

GEORGIA INSTITUTE OF TECHNOLOGY OFFICE OF CONTRACT ADMINISTRATION

## SPONSORED PROJECT TERMINATION SHEET

SR 39
12-1-83
8(

Date 4/14/83

Project Title: Air Sampling, City of Greenville, South Carolina

Project No: A-3450

Project Director: William M. Ewing

Sponsor: City of Greenville, SC

Effective Termination Date: 2/28/83

Clearance of Accounting Charges: 2/28/83

Grant/Contract Closeout Actions Remaining:

- [x] Final Invoice ~~and Closing Documents~~
- [ ] Final Fiscal Report
- [ ] Final Report of Inventions
- [ ] Govt. Property Inventory & Related Certificate
- [ ] Classified Material Certificate
- [ ] Other _____

Assigned to: EDL/SHD (~~School~~/Laboratory)

COPIES TO:

| | | |
|---|---|---|
| Administrative Coordinator | Research Security Services | EES Public Relations (2) |
| Research Property Management | ~~Reports Coordinator (OCA)~~ | Computer Input |
| Accounting | Legal Services (OCA) | Project File |
| Procurement/EES Supply Services | Library | Other Ewing |

# AIRBORNE FIBER DETERMINATION

# FOR

# CITY OF GREENVILLE, SOUTH CAROLINA

Final Report
GTRI Project Number A-3450
February 25, 1983

GEORGIA INSTITUTE OF TECHNOLOGY
Engineering Experiment Station
Safety and Health Division
Atlanta, Georgia 30332
February 1983

## TABLE OF CONTENTS

# AIRBORNE FIBER DETERMINATION

# FOR

# CITY OF GREENVILLE, SOUTH CAROLINA

## 1.0 INTRODUCTION

The Georgia Tech Research Institute was retained by Mr. Carl Burkhart of the City of Greenville, South Carolina to perform air sampling at their West End and Pleasantburg fire stations. The purpose of the study was to measure the concentration of airborne fibers (greater than 5 micrometers in length) at selected locations at each of these stations. The sampling was conducted on January 26, 1983 by William M. Ewing of Georgia Tech. While at the facility he was accompanied by Mr. Carl Burkhart. The following report summarizes the results of the study including conclusions and recommendations.

## 2.0 CONCLUSIONS AND RECOMMENDATIONS

### 2.1 CONCLUSIONS

2.1.1 Bulk samples collected from each station and analyzed for asbestos confirmed the presence of chrysotile asbestos in the spray-applied acoustical material at each site.

2.1.2 All of the six area air samples collected at the West End Fire Station were below the limit of detection for the method of analysis employed.

2.1.3 Four of the six area air samples collected at the Pleasantburg Fire Station indicated fiber concentrations at the limit of detection (0.01 fibers* per cubic centimeter of air sampled). The remaining two samples were below the limit of detection for the method of analysis employed.

2.1.4 The sprayed-on acoustical material appeared hard and in good repair with some noted exceptions at both sites.

2.1.5 Delamination of the material has occured in the shower areas of both facilities due to the high humidity of these areas.

2.1.6 Several unpainted ceilings were found to be more friable (flaking) than the painted surfaces. These areas are noted in Section 4.0 of this report.

2.1.7 The Pleasantburg station has several areas where water has damaged the material. Most notably in the apparatus and dormitory rooms.

2.18 The slightly higher fiber counts found at the Pleasantburg station is probably due to the age of the material. This station was built two years prior to the construction of the West End station.

*greater than 5 micrometers in length

2.1.9 The results of air sampling at both stations did not indicate exposures in excess of the OSHA Asbestos standard, the OSHA "action level," or the NIOSH recommended permissible exposure limit.*

2.2 RECOMMENDATIONS

2.2.1 The most permanent solution to abate the potential hazard posed by the asbestos-containing acoustical spray at these facilities would be the removal of these materials. It should be noted that the U. S. Environmental Protection Agency (EPA) National Ambient Air Standard for Asbestos (copy attached, see Appendix D) requires that all friable asbestos-containing materials be removed prior to demolition of these structures.

2.2.2 Should total removal not be feasible, partial removal and encapsulation of remaining areas should be considered. Removal should be performed in the shower areas, closets, and the storage and janitorial closets adjacent to the apparatus room of each site. Encapsulation of these areas would be inappropriate due to the delaminating of the material in the shower areas and the physical damage which has occurred and would be likely to occur in the future in the other areas. Removal would also be appropriate for the patio/foyer ceiling (outside) and the outside eaves above the apparatus room doors.

2.2.3 Encapsulation of all other areas where sprayed-on acoustical material is present would be a viable means of control since the material is attached firmly to the substrate, the material is not readily accessible to human contact, the material is cohesive (cementitious), and further water damage is not likely (the roof at the Pleasantburg station has been repaired).

2.2.4 Before proceeding further the following advantages and disadvantages of encapsulation should be considered.

Advantages
- controls exposure
- quickest method of control
- least expensive control method in the short run

Disadvantages
- asbestos source remains
- thermal or acoustical insulating properties may be reduced or lost
- additional weight of the sealant may accelerate delamination or deteriorations
- management system is required; precautions are necessary to prevent damage during maintenance or renovation
- continued inspection required to check for damage to encapsulated surface
- maintenance of encapsulated surface, including periodic recoating, is required
- encapsulated material is extremely difficult to remove in compliance with EPA and OSHA regulations

*Note: Personal sampling was not advised since the sampling equipment could have interferred with the firemen's ability to perform their duties.

2.2.5 Should encapsulation be chosen, it is important that a bridging sealant be used rather than a penetrating sealant since cementitious materials are ill-suited for the permeating action of a penetrating sealant, as there is little air space for the sealant to permeate.

2.2.6 An important consideration when choosing a sealant is the extent to which it releases smoke and toxic gases when burned, a characteristic closely related to its fireproofing qualities. Care should be taken not to select a sealant which will release a large amount of toxic gas when burned, or which proves to be extremely flammable. These characteristics vary greatly from sealant to sealant without respect to the sealant's type; it is strongly recommended, however, that the sealant chosen have a good resistance to flame. Manufacturers will usually provide this information for their products.

2.2.7 One type of sealant that should be considered is a bridging acrylic sealant which should provide a very tough elastic film about 3 millimeters (mm) thick over the surface of the material.

2.2.8 Whatever sealant is applied we recommend that a pigment be specified, both for the asthetic reason and to facilitate inspection for proper coverage.

2.2.9 Latex paint may be a possible sealant for the material. Should this be considered, a latex paint with a high percentage of total solids should be used (greater than 40% solids). If the percentage of total solids is not stated explicitly on the label, it can be determined by adding the percentages of pigment and resin in the paint.

2.2.10 Most importantly, when approaching any encapsulation abatement project the sealant(s) chosen must first be tested on the material to be encapsulated. Special attention should be paid to the sealant's ability to adhere to the acoustical insulation, its flexibility, and resistance to impact and abrasion.

2.2.11 Once encapsulated the material should be inspected routinely for damage and/or deterioration.

2.2.12 City employees and contractor personnel should be informed of the presence of asbestos and proper precautions specified if the material is to be disturbed. (These items are addressed in GTRI Report No. A-3291 to the City of Greenville, S.C.)

2.2.13 Before encapsulation is performed, legal advice should be obtained regarding cost recovery if this is to be considered by the City of Greenville. Should this be the plan of the City of Greenville, your attorney may recommend removal of the material be completed.

## 3.0 DESCRIPTION OF FACILITIES

### 3.1 WEST END FIRE STATION NO. 2

This station is a single-story structure which houses the men and fire-fighting equipment. It was constructed in 1969 by the Cely Construction and Supply Company (General Contractors) and designed by Townes and Associates, Architects, of Greenville. The station is manned 24 hours per day with a total of twelve men. The sprayed-on acoustical/decorative material was reported on the original drawings to be "Perl-Kote." The material is approximately $\frac{1}{4}$ inch deep on all ceiling surfaces except the hose drying room, storage room No. 2, and equipment rooms 1 and 2. Further information concerning the material is included in section 4.0 of this report. The square footage for this building was estimated from the drawings to be approximately 7300 square feet. Figure 3.1 is a sketch of the building (not to scale) as it appeared on January 26, 1983.

### 3.2 PLEASANTBURG FIRE STATION NO. 5

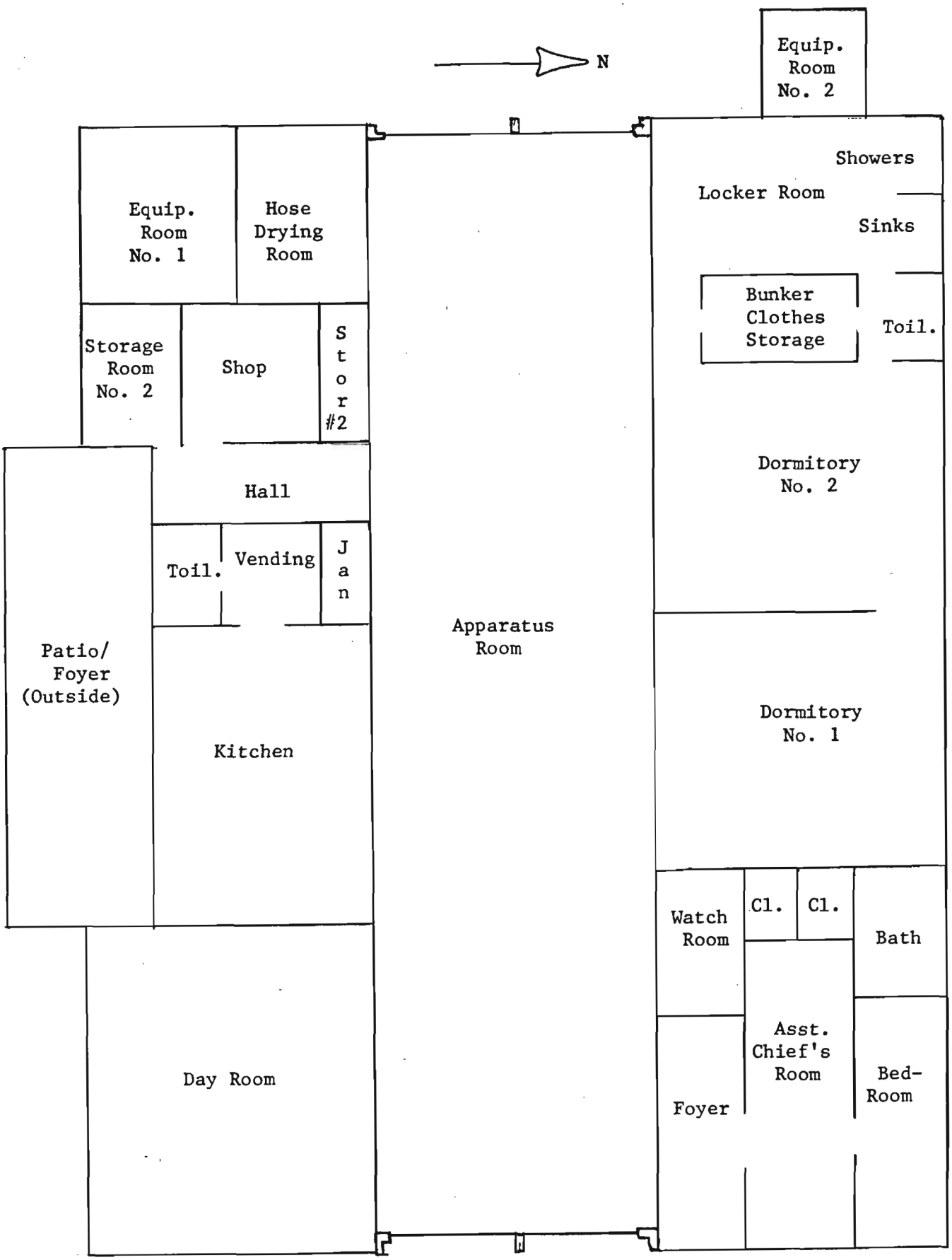
The Pleasantburg fire station is a mirror image of the West End fire station. It was constructed in 1967 by the same contractor who would later build the West End station. Similar to the West End station, "Perl-Kote" was specified on the drawings by the architects. This station is also manned around-the-clock by twelve men working three shifts. Figure 3.2 is a sketch of this facility (not to scale) as it appeared on January 26, 1983. The approximate square footage is 7800 square feet.

## 4.0 PRESENTATION AND DISCUSSION OF FINDINGS

### 4.1 SURVEY PROTOCOL AND BACKGROUND INFORMATION

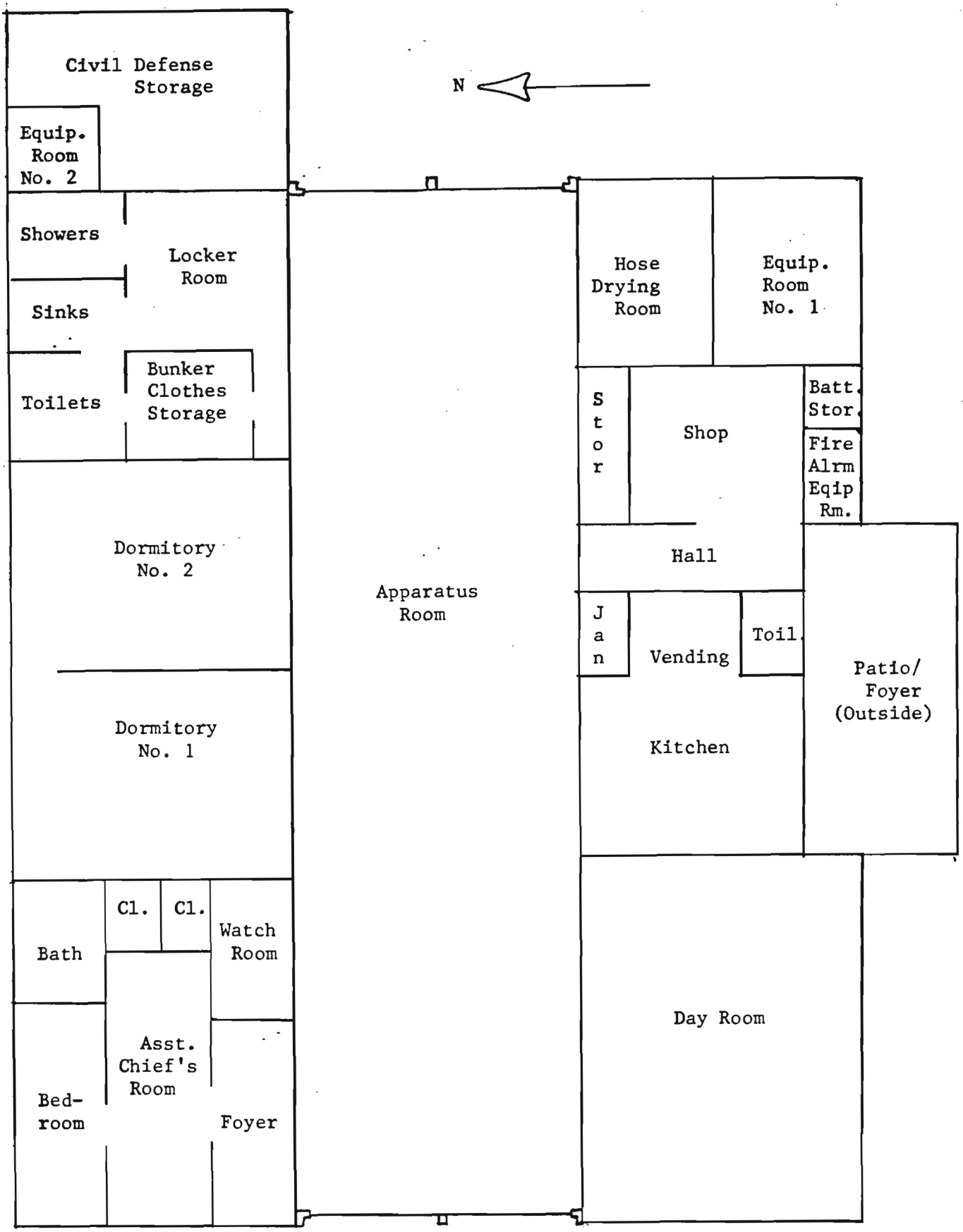
Prior to this survey, the City of Greenville had surveyed their buildings to determine the presence of sprayed-on friable materials. One bulk sample of the material had been collected by Mr. Joseph Weber (City of Greenville) from the shower ceiling at each fire station. These samples were analyzed using polarized light microscopy by Northrop Services, Inc. (a copy of the results are attached in Appendix B). The results indicated the presence of 10 percent chrysotile asbestos in the West End Station and 4 percent chrysotile asbestos in the Pleasantburg Station. Based on this information, employees at each were informed about the presence of asbestos in the acoustical spray at the two sites.

The survey protocol was designed to collect air samples at selected locations throughout each building to determine the presence of airborne fibers (greater than 5 micrometers in length). The phase-contrast microscopy method of analysis (National Institute for Occupational Safety and Health (NIOSH) P & CAM Method 239) was chosen rather than transmission electron microscopy (TEM) for two reasons. First, it is the method specified by the Occupational Safety and Health Administration (OSHA) for compliance with the Asbestos Standard (29 CFR 1910.1001) and secondly, TEM would have increased the cost of the study by approximately $4000. The protocol established that six full shift (8-hour, time-weighted average (TWA)) area samples be collected at each station.




WEST END FIRE STATION
Greenville, South Carolina

Figure 3.1




PLEASANTBURG FIRE STATION
Greenville, South Carolina

Figure 3.26-

## 4.2 SAMPLING AND SURVEY RESULTS

One additional bulk sample was collected from the ceiling of the apparatus room at each site. Each of these samples were analyzed in the laboratories of Georgia Tech by PLM. The results indicated 5 percent chrysotile asbestos in each sample confirming the findings of Mr. Weber's previous sampling. These results have been compiled in Table A-3 of Appendix A.

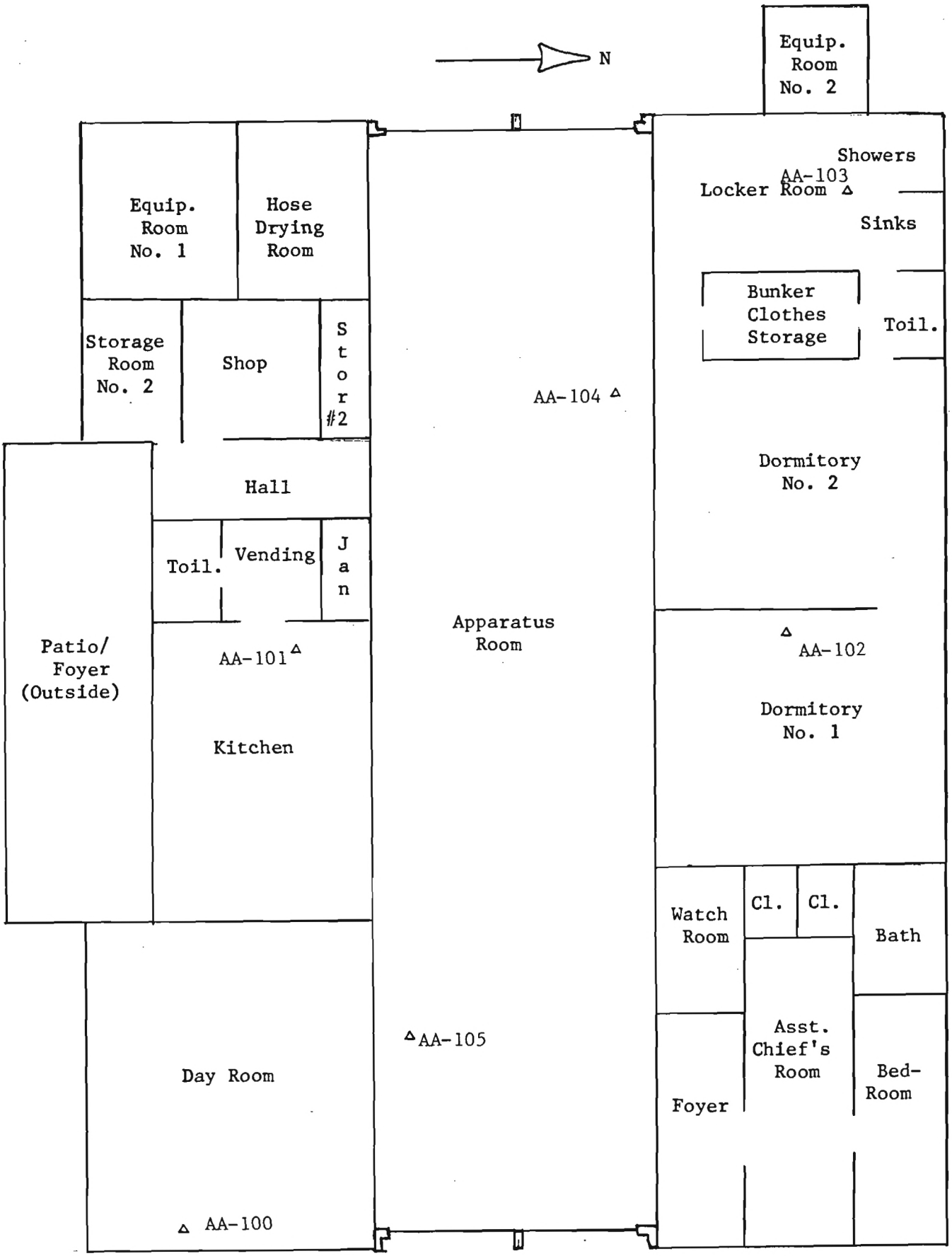
The air samples were collected at the locations indicated on Figures 4.1 and 4.2 throughout the day shift. All six of the air samples collected at the West End Station indicated airborne fiber concentrations below the limit of detection for this method. Accordingly, the value of less than 0.01 fibers* per cubic centimeter (fibers*/cc) has been reported for each sample on Table A-1 of Appendix A. Four of the six area air samples collected at the Pleasantburg Fire Station indicated airborne fiber* concentrations at the detection limit of 0.01 fibers*/cc. The remaining two area air samples collected at this site indicated airborne fiber* concentrations below the practical limit of detection. Accordingly, values of less than 0.01 fibers*/cc are reported for these samples in Table A-2 of Appendix A. It should be noted that all sample results are calculated as 8-hour, time-weighted averages.

All air samples indicated fiber* concentrations below the current OSHA permissible exposure limit (PEL) of 2.0 fibers*/cc, determined as an 8-hour, TWA. These values were also below the NIOSH recommended PEL and the OSHA "action level" of 0.1 fibers*/cc for 8 hours. Accordingly, further action with regards to the OSHA Standard is not required at this time. A copy of this standard is included in Appendix D of this report.

The condition of the sprayed-on material was found to be in good repair with several exceptions. Most notably was the delamination of the material in the shower area of each station due to the high humidity in these areas. The other area of concern is the apparatus room of each building where some of the sprayed-on material has fallen from the "seams" in the ceiling. These seams are where the concrete ceiling members join. At the West End Station the damage appears to be due to minor shifting of these concrete members. At the Pleasantburg station the damage appears to be due to water as evidenced by stains around these seams.

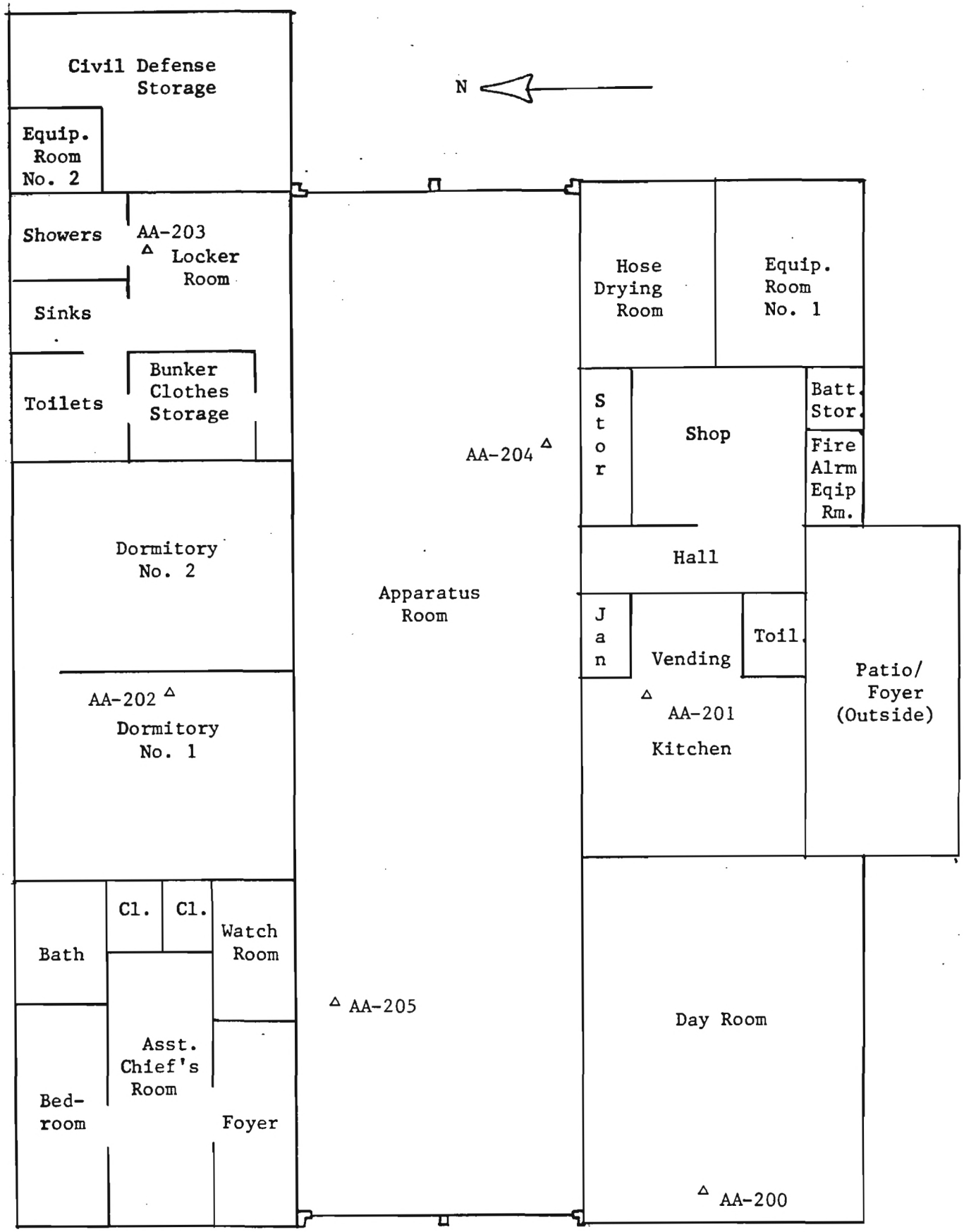
Figures 4.3 and 4.4 indicate what rooms in each station have the spray-applied acoustical insulation. The material was not used in some areas where equipment hoses, or material would be stored. For the most part, the material is not readily accessible except in the storage and janitorial rooms off the apparatus floor and the two closets. In these areas the material has been scraped and damaged. It was also noted that in these areas, the apparatus room and the patio (outside) the material does not appear to have been painted. All other areas have been painted with a penetrating type paint. The unpainted ceilings were noticably more friable than the unpainted areas.

*greater than 5 micrometers in length



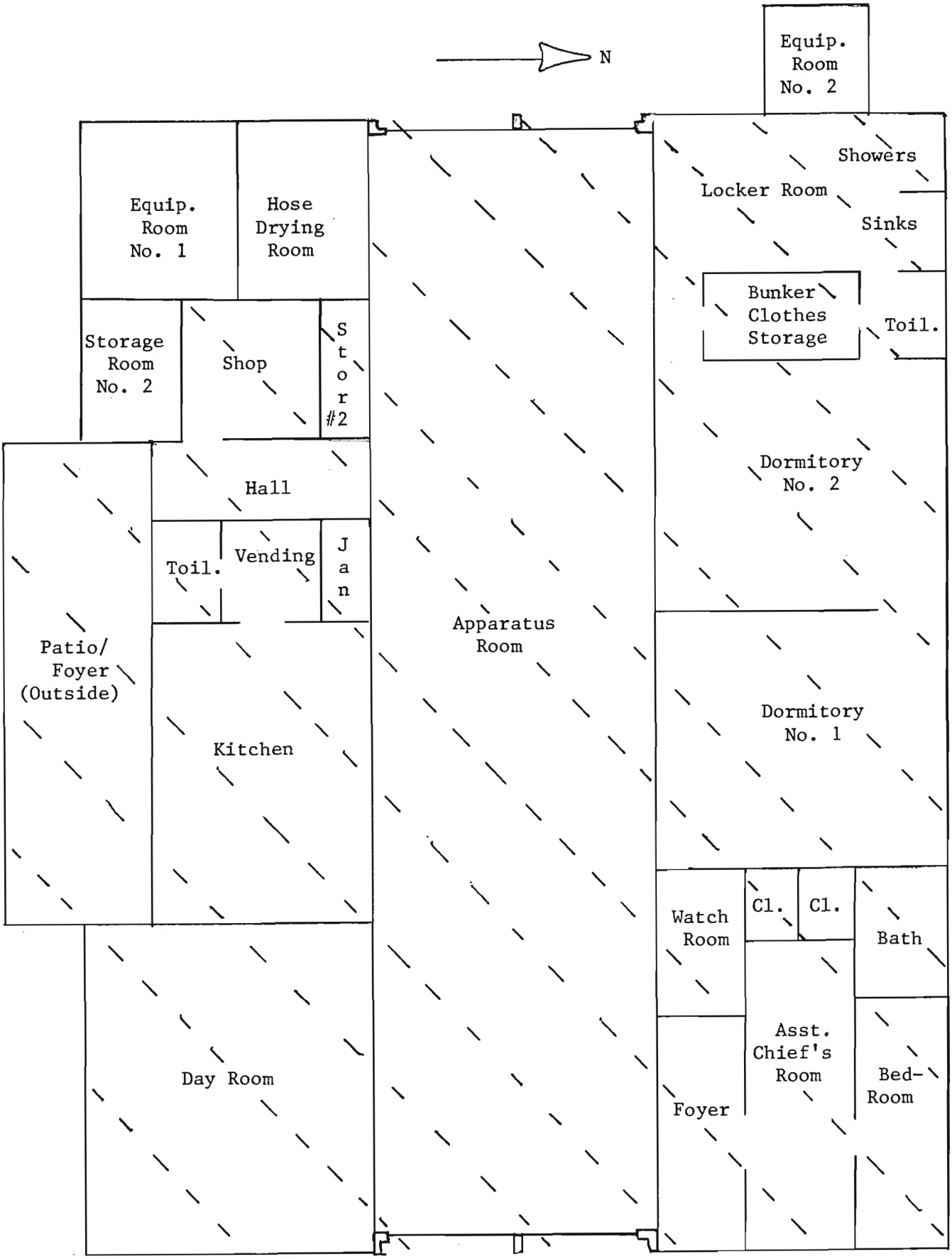

AIR SAMPLE LOCATIONS
WEST END FIRE STATION
Greenville, South Carolina

Figure 4.1



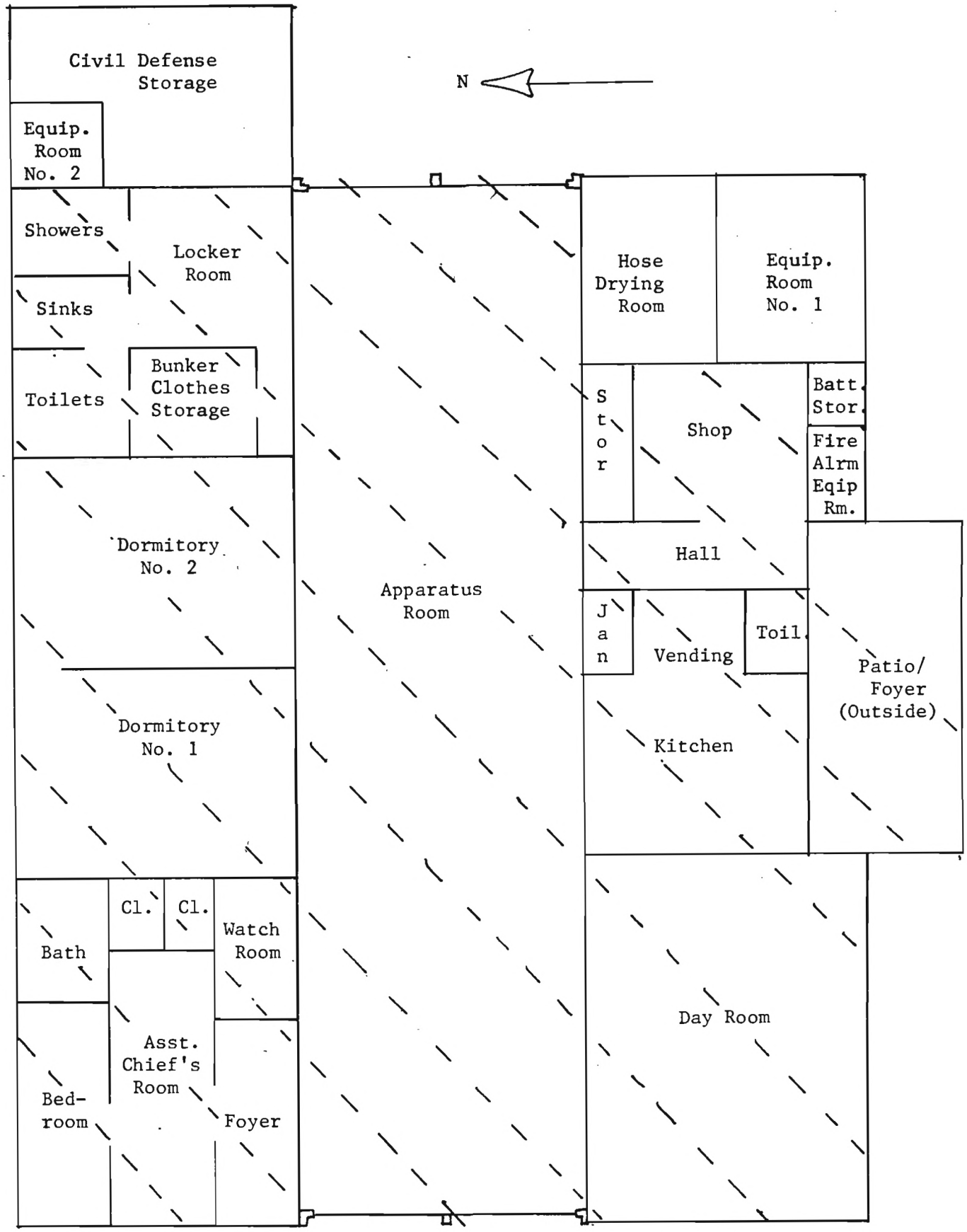

SAMPLE LOCATIONS
PLEASANTBURG FIRE STATION
Greenville, South Carolina

Figure 4.2




LOCATION OF ASBESTOS-CONTAINING MATERIALS
WEST END FIRE STATION
Greenville, South Carolina

Figure 4.3




LOCATION OF ASBESTOS-CONTAINING MATERIALS
PLEASANTBURG FIRE STATION
Greenville, South Carolina

Figure 4.4

It was noted that the same acoustical material was applied to the ceiling of the patio and under the eaves of the apparatus room doors. Since each of these areas are outside the building, and exposed to the elements, deterioration will be accelerated.

This Report Prepared By:

William M. Ewing
Industrial Hygienist

This Report Approved By:

James L. Burson, CIH, CSP
Chief, Safety and Health Division

WME:JLB:sek

## APPENDIX A

Results of Sampling

TABLE A-1

GEORGIA INSTITUTE OF TECHNOLOGY
Engineering Experiment Station
Safety & Health Services

Report No. A-3450

INDUSTRIAL HYGIENE SAMPLING SUMMARY

**Plant** West End Fire Stateion

Greenville, South Carolina

**Materials** Fibers greater that 5 micrometers in length

| Date 1983 | Sample Number | Description | Sampling Period | | Sample Volume (Liters) | Sample Time (Min.) | Concentration | |
|---|---|---|---|---|---|---|---|---|
| | | | Start | Stop | | | Fibers per Filter | Fibers per cc air |
| 1/26 | A-100 | Area Sample, Day room, east end of room | 0810 | 1532 | 897 | 442 | 6700 | <0.01 |
| 1/26 | AA-101 | Area Sample, Kitchen, top of refrigerator | 0813 | 1535 | 897 | 442 | 3000 | <0.01 |
| 1/26 | AA-102 | Area Sample, Dorm #1, by west wall | 0815 | 1537 | 902 | 442 | 8400 | <0.01 |
| 1/26 | AA-103 | Area Sample, locker room, north end | 0815 | 1536 | 895 | 441 | 7000 | <0.01 |
| 1/26 | AA-104 | Area Sample, apparatus room, west end | 0821 | 1531 | 869 | 430 | <3000 | <0.01 |
| 1/26 | AA-105 | Area Sample, apparatus room, east end | 0821 | 1531 | 869 | 430 | 4500 | <0.01 |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

TABLE A-2

GEORGIA INSTITUTE OF TECHNOLOGY
Engineering Experiment Station
Safety & Health Services

Report No. A-3450

INDUSTRIAL HYGIENE SAMPLING SUMMARY

**Plant** Pleasantburg Fire Station
Greenville, South Carolina

**Materials** Fibert greater that 5 micrometers in length

| Date 1983 | Sample Number | Description | Sampling Period | | Sample Volume (Liters) | Sample Time (Min.) | Concentration | |
|---|---|---|---|---|---|---|---|---|
| | | | Start | Stop | | | Fibers per Filter | Fiber per cc air |
| 1/26 | AA-200 | Area sample, day room, west wall | 0848 | 1620 | 895 | 452 | 9800 | 0.01 |
| 1/26 | AA-201 | Area sample, kitchen, near vending machines | 0850 | 1620 | 914 | 450 | 9200 | 0.01 |
| 1/26 | AA-202 | Area sample, Dorm #1, near east wall | 0853 | 1623 | 918 | 450 | 5600 | <0.01 |
| 1/26 | AA-203 | Area sample, locker room, across from shower | 0853 | 1623 | 909 | 450 | 8400 | 0.01 |
| 1/26 | AA-204 | Area sample, Apparatus room, east end | 0857 | 1621 | 897 | 444 | 9000 | 0.01 |
| 1/26 | AA-205 | Area sample, Apparatus room, west end | 0857 | 1621 | 888 | 444 | 4500 | <0.01 |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

TABLE A-3

RESULTS OF BULK SAMPLE ANALYSES

FOR

CITY OF GREENVILLE, SOUTH CAROLINA

GTRI Project #A-3450

| Sample Number | Sample Description | Asbestos (yes/no) | Analytical Results |
|---|---|---|---|
| 2659 | Acoustical Spray From West End Fire Station Apparatus Room | yes | 5% chrysotile asbestos in particulate. Also 20% cellulose |
| 2660 | Acoustical Spray From Pleasantburg Fire Station Apparatus Room | yes | 5% chrysotile asbestos in particulate |

Note: All samples analyzed using polarized light microscopy with dispersion staining.

## APPENDIX B

Prior Sampling and Notification

**NORTHROP SERVICES, INC.** A Subsidiary of Northrop Corporation

ENVIRONMENTAL SCIENCES

P.O. Box 12313
Research Triangle Park, N. C. 27709
Telephone: (919) 549-0611

4240-82-2-1121

October 28, 1982

Joe Weber, Superintendent
Building Maintenance
THE CITY OF GREENVILLE
P.O. Box 2207
Greenville, SC 29602

Re: Letter of 10/21/82; 2 samples for asbestos identification

Dear Mr. Weber:

Enclosed are the results of the bulk samples you recently sent. Thank you for thinking of NSI's Analytical Microscopy Laboratory. We hope we can be of further service to you in the near future.

A statement of charges will be sent under separate cover. If we can be of any further service, please do not hesitate to call.

Best regards,

Reginald C. Jordan, CIH
Manager, Quality Assurance and
Environmental Monitoring Programs

RCJ/gc

Enclosures

These analyses were performed by David L. Kirby of the NSI-ES Quality Assurance and Environmental Monitoring Programs staff.

Reviewed and approved by:

Reginald L. Jordan, CIH
Manager, Quality Assurance and
Environmental Monitoring Programs

# IDENTIFICATION OF ASBESTOS BY POLARIZED LIGHT MICROSCOPY

The following procedure is used to process bulk samples and to identify and quantitate the composition of each:

The bulk sample is observed under lower power (6-12X) under a stereomicroscope. The approximate sample composition is noted with respect to fibrous vs. non-fibrous components present. A representative portion of the observed sample is mounted and observed under cross polarized light at 125X. Birefringent fibers, non-birefringent fibers, and non-fibrous components are noted. Birefringent fibers are observed for extinction type and angle, sign of elongation, and retardation colors.

The fibers are then immersed in a series of high dispersion refractive index media, and the dispersion staining colors noted. Positive identification of asbestos components is based on specific dispersion staining colors.

QUALITY CONTROL PROGRAM FOR ASBESTOS IDENTIFICATION

## 2.1 ASBESTOS IDENTIFICATION SAMPLES

Quality control check samples will be analyzed at a rate approximately 1 QC sample per 10 bulk samples. The QC check samples will consist of both "known" (standard) samples for accuracy; and replicate samples for precision.

Analysis of data will consist of two parts: a Pareto analysis will be conducted on accuracy of identification.

The Pareto analysis (see Juran, Quality Control Handbook) will be used to describe the number of misidentifications by asbestos type as a function of the total number of misidentifications. An example is shown in Figure 2.1-1. Accuracy information will be plotted. Acceptance level is 0(zero) misidentifications.

Quality control charts will be used to track precision. Both standard samples and replicates will be used. Initially, a set of charts will be developed in order to more accurately assess an acceptable error level.

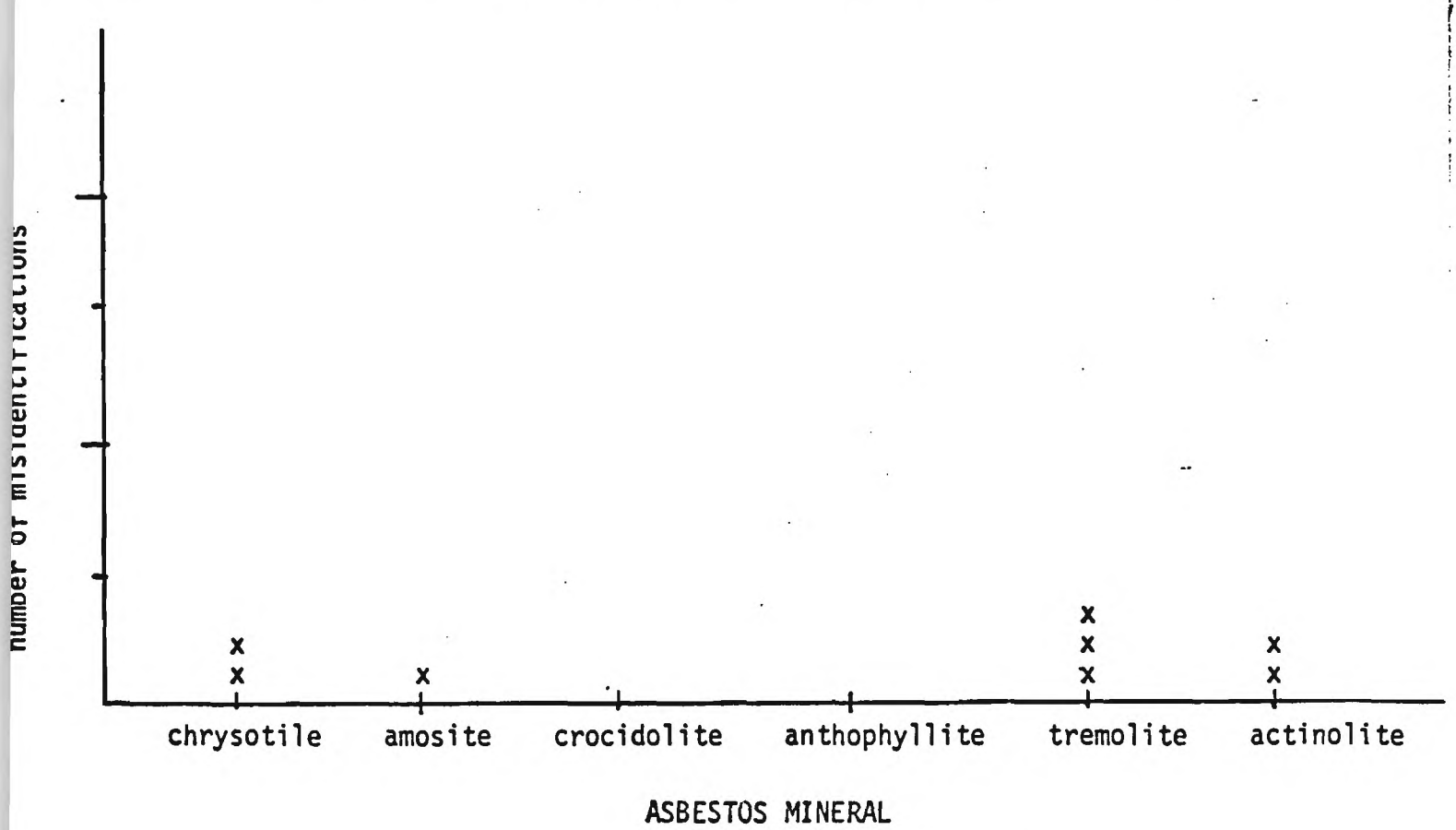



FIGURE 2.1-1 Pareto Analysis of Misidentifications by Asbestos Mineral

NORTHROP SERVICES INC.
ENVIRONMENTAL SCIENCES
A SUBSIDIARY OF NORTHROP CORPORATION

## alytical Microscopy Laboratory

4240-82-2-1121

tomer ID #1
ES ID 4461
New West End Station

Date October 28, 1982
Customer City of Greenville, SC
Type of Analysis Asbestos Identification
Technique Polarized Light Microscopy

### eneral Observation of the Sample

e sample is an off-white, thin, nodular sheet with evidence of a coating on one de. Under observation with the stereomicroscope, the sample consists of shiny, anular nodules and powder mixed with irregular fibers.

### bservations Under Polarized Light

(mounting medium) = 1.550 HD

e fibers in the sample are long, serpentine, and exist in fraying bundles. These bers show parallel extinction and have a positive sign of elongation. The particulate brown, flaky, isotropic, and shows cleavage lines.

### Dispersion Staining

| | | | | | |
|---|---|---|---|---|---|
| 1.550 HD | $n_{\parallel}$ | magenta | $n_{\perp}$ | blue |
| | $n_{\parallel}$ | | $n_{\perp}$ | |
| | $n_{\parallel}$ | | $n_{\perp}$ | |

### onclusions

| Sample Constituent | Estimated % Composition |
|---|---|
| chrysotile asbestos | 10% |
| perlite | 90% |



JC

NORTHROP SERVICES INC.
ENVIRONMENTAL SCIENCES
A SUBSIDIARY OF NORTHROP CORPORATION

## nalytical Microscopy Laboratory

4240-82-2-1121

Date October 28, 1982

stomer ID #2

Customer City of Greenville, SC

I-ES ID 4462

Wait Street Station

Type of Analysis Asbestos Identification

Technique Polarized Light Microscopy

### General Observation of the Sample

The sample is an off-white, thin, nodular sheet with evidence of a coating on one side. Under observation with the stereomicroscope, the sample consists of shiny, granular nodules and powder mixed with irregular fibers.

### Observations Under Polarized Light

5 (mounting medium) = 1.550 HD

The fibers in the sample are long, serpentine, and exist in fraying bundles. These fibers show parallel extinction and have a positive sign of elongation. The particulate is brown, flaky, isotropic, and shows cleavage lines.

### Dispersion Staining

| | | | | | |
|---|---|---|---|---|---|
| 5 | 1.550 HD | $n_{\parallel}$ | magenta | $n_{\perp}$ | blue |
| 5 | | $n_{\parallel}$ | | $n_{\perp}$ | |
| 5 | | $n_{\parallel}$ | | $n_{\perp}$ | |

### Conclusions

| Sample Constituent | Estimated % Composition |
|---|---|
| chrysotile asbestos | 4% |
| perlite | 96% |



gc

SCRIPT

The ceilings here at the Fire Station are made of concrete but they are sprayed with a material called Perlite. The purpose of the material is for an interior finish. It doesn't provide insulation or fireproofing.

Because of the asbestos that we found in City Hall, we decided to look into other City buildings. We took a sample of the sprayed on Perlite from the ceiling here and had it analyzed. We found just a little portion of it (less than 10%) is asbestos.

This situation is not at all like that in City Hall. The Perlite which is sprayed on here is very hard and brittle and not flaky as the fireproofing is in City Hall. There is very little chance that any of this Perlite with asbestos can get into the air even if it gets flaked off or knocked into.

We wanted you to know that this material on the ceilings contains asbestos, but we also want you to know that we are not at all concerned for your health.

Very shortly we will be hiring Georgia TECH to take air samples here at the Fire Station just as they took air samples in City Hall. After this sampling, we'll be in a much better position to determine exactly how much of this asbestos and Perlite product is getting into the air.

As I said before, this material is hard and brittle and not flaky or dusty and we are truly not concerned for anybody's health. We promise to keep you informed at every step of the way.

Do any of you have any questions?

CB/cbm-40

## APPENDIX C

Sampling and Analytical Methods

(Summary: Copies of Entire Methods
Available Upon Request)

## ASBESTOS

Samples for the determination of airborne asbestos fibers were collected by drawing air at measured flowrates through open-face cassettes containing 37-millimeter diameter cellulose ester membrane filters (Millipore, Type AA) using battery-powered, portable pumps. After collection of each sample the cassette was covered and sealed immediately for transport to the laboratory.

Each sample was analyzed subsequently for asbestos fibers using the microscopic technique currently specified by the National Institute for Occupational Safety and Health (NIOSH). Briefly, the technique consisted of the following steps: a wedge-shaped sector of each filter was cut carefully from the sample and mounted on a standard microscope slide, using a high-viscosity solution of membrane filter material in a 1:1 mixture of diethyl oxalate and dimethyl phthalate to render the filter transparent. Asbestos fibers, defined as particules having aspect rations (apparent length to width) of three or greater, which were observable on the surface of the filter were counted using a binocular microscope equipped with 10X eyepieces and a 40X objective with phase contrast illumination. Porton reticle fields, selected at random on the sample, were examined and fibers greater than five micrometers in length were counted until either of two conditions was satisfied:

1. A minimum of 100 fibers was counted in 20 or more fields.

2. A minimum of 100 fields was examined.

Results of the microscopic analyses were used in conjunction with field sampling data (measured flowrates and durations of sampling) to calculate the concentrations of airborne asbestos fibers corresponding to each sample in units of fibers greater than five micrometers in length per cubic centimeter of air (fibers > 5 μm per cc).

## APPENDIX D

EPA and OSHA Asbestos Standards

## OSHA

## 1910.1001 - ASBESTOS

(a) Definitions

For the purpose of this section.

(1) "Asbestos" includes chrysotile, amosite, crocidolite, tremolite, anthophyllite, and actinolite.

(2) "Asbestos fibers" means asbestos fibers longer than 5 micrometers.

(b) PERMISSIBLE EXPOSURE TO AIRBORNE CONCENTRATIONS OF ASBESTOS FIBERS

(1) Standard effective July 7, 1972. The 8-hour, time-weighted average airborne concentrations of asbestos fibers to which any employee may be exposed shall not exceed five fibers, longer than 5 micrometers, per cubic centimeter of air, as determined by the method prescribed in paragraph (e) of this section.

(2) Standard effective July 1, 1976. The 8-hour, time-weighted average airborne concentrations of asbestos fibers to which any employee may be exposed shall not exceed two fibers, longer than 5 micrometers, per cubic centimeter of air, as determined by the method prescribed in paragraph (e) of this section.

(3) Ceiling concentration. No employee shall be exposed at any time to airborne concentration of asbestos fibers in excess of 10 fibers, longer than 5 micrometers, per cubic centimer of air, as determined by the method prescribed in paragraph (e) of this section.

(c) METHODS OF COMPLIANCE

(1) ENGINEERING METHODS

(i) Engineering controls. Engineering controls, such as but not limited to, isolation, enclosure, exhaust ventilation, and dust collection, shall be used to meet the exposure limits prescribed in paragraph (b) of this section.

(ii) LOCAL EXHAUST VENTILATION

(a) Local exhaust ventilation and dust collection systems shall be designed, constructed, installed, and maintained in accordance with the American National Standard Fundamentals Governing the Design and Operation of Local Exhaust Systems, ANSI Z9.2-1971, which is incorporated by reference herein.

(b) See Section 1910.6 concerning the availability of ANSI-A9.2-1971, and the maintenance of a historic file in connection therewith. The address of the American National Standards Institute is given in Section 1910.100.

(iii) PARTICULAR TOOLS

All hand-operated and power-operated tools which may produce or release asbestos fibers in excess of the exposure limits prescribed in paragraph (b) of this section, such as, but not limited to, saws, scorers, abrasive wheels, and drills, shall be provided with local exhaust ventilation systems in accordance with subdivision (ii) of this subparagraph.

(2) WORK PRACTICES

(i) Wet methods. Insofar as practicable, asbestos shall be handled, mixed, applied, removed, cut, scored, or otherwise worked in a wet state sufficient to prevent the emission of airborne fibers in excess of the exposure limits prescribed in paragraph (b) of this section, unless the usefulness of the product would be diminished thereby.

(ii) Particular products and operations. No asbestos cement, mortar, coating, grout, plaster, or similar material containing asbestos shall be removed from bags, cartons, or other containers in which they are shipped, without being either wetted, or enclosed, or ventilated so as to prevent effectively the release of airborne asbestos fibers in excess of the limits prescribed in paragraph (b) of this section.

(iii) Spraying, demolition, or removal. Employees engaged in the spraying of asbestos, the removal, or demolition of pipes, structures, or equipment covered or insulated with asbestos, and in the removal or demolition of asbestos insulation or coverings shall be provided with respiratory equipment in accordance with paragraph (d) (2) (iii) of this section and with special clothing in accordance with paragraph (d) (3) of this section.

(d) PERSONAL PROTECTIVE EQUIPMENT

(1) Compliance with the exposure limits prescribed by paragraph (b) of this section may not be achieved by the use of respirators or shift rotation of employees, except:

(i) During the time period necessary to install the engineering controls and to institute the work practices required by paragraph (c) of this section;

(ii) In work situations in which the methods prescribed in paragraph (c) of this section are either technically not feasible or feasible to an extent insufficient to reduce the airborne concentrations of asbestos fibers below the limits prescribed by paragraph (b) of this section; or

(iii) In emergencies.

(iv) Where both respirators and personnel rotation are allowed by subdivision (i) and (ii), or (iii) of this subparagraph, and both are practicable, personnel rotation shall be preferred and used.

(2) Where a respirator is permitted by subparagraph (1) of this paragraph, it shall be selected from among those approved by the Bureau of Mines, Department of the Interior, or the National Institute for Occupational Safety and Health Department, of Health, Education, and Welfare, under the provisions of 30 CFR Part 11 (37 P.R. 6244, March 25, 1972), and shall be used in accordance with subdivisions (i), (ii), (iii), and (iv) of this subparagraph.

(i) Air purifying respirators. A reusable or single use air purifying respirator, or a respirator described in subdivision (ii) or (iii) of this subparagraph, shall be used to reduce the concentrations of airborne asbestos fibers in the respirator below the exposure limits prescribed in paragraph (b) of this section, when the ceiling or the 8-hour, time-weighted average airborne concentrations of asbestos fibers are reasonably expected to exceed no more than 10 times those limits.

(ii) Powered air purifying respirators. A full facepiece powered air purifying respirator, or a powered air purifying respirator, or a respirator described in subdivision (iii) of this subparagraph, shall be used to reduce the concentrations of airborne asbestos fibers in the respirator below the exposure limits prescribed in paragraph (b) of this section, when the ceiling or the 8-hour, time-weighted average concentrations of asbestos fibers are reasonably expected to exceed 10 times, but not 100 times, those limits.

(iii) Type "C" supplied-air respirators, continuous flow or pressure-demand class. A type "C" continuous flow or pressure-demand, supplied air respirator shall be used to reduce the concentrations of airborne asbestos fibers in the respirator below the exposure limits prescribed in paragraph (b) of this section, when the ceiling or the 8-hour, time-weighted average airborne concentrations of asbestos fibers are reasonably expected to exceed 100 times those limits.

(iv) ESTABLISHMENT OF A RESPIRATOR PROGRAM

(a) The employer shall establish a respirator program in accordance with the requirements of the American National Standard Practices for respiratory Protection, ANSI Z88.2-1969, which is incorporated by reference herein.

(b) See Section 1910.6 concerning the availability of ANSI Z88.2-1969 and the maintenance of an historic file in connection therewith. The address of the American National Standards Institute is given in Section 1910.100.

(c) No employee shall be assigned to tasks requiring the use of respirators if, based upon his most recent examination, an examining physician determines that the employee will be unable to function normally wearing a respirator, or that the safety or health of the employee or other employees will be impaired by his use of the respirator. Such employee shall be rotated to another job or given the opportunity to transfer to a different position whose duties he is able to perform with the same employer, in the same geographical area and with the same seniority, status, and rate of pay he had just prior to such transfer, if such a different position is available.

(3) Special Clothing: The employer shall provide, and require the use of, special clothing, such as coveralls or similar whole body clothing, head coverings, gloves, and foot coverings for any employee exposed to airborne concentrations of asbestos fibers, which exceed the ceiling level prescribed in paragraph (b) of this section.

(4) Change rooms:

(i) At any fixed place of employment exposed to airborne concentrations of asbestos fibers in excess of the exposure limits prescribed in paragraph (b) of this section, the employer shall provide change rooms for employees working regularly at the place.

(ii) Clothes lockers: The employer shall provide two separate lockers or containers for each employee, so separated or isolated as to prevent contamination of the employee's street clothes from his work clothes.

(iii) Laundering:

(a) Laundering of asbestos-contaminated clothing shall be done so as to prevent the release of airborne asbestos fibers in excess of the exposure limits prescribed in paragraph (b) of this section.

(b) Any employer who gives asbestos-contaminated clothing to another person for laundering shall inform such person of the requirement in (a) of this subdivision to effectively prevent the release of airborne asbestos fibers in excess of the exposure limits prescribed in paragraph (b) of this section.

(c) Contaminated clothing shall be transported in sealed impermeable bags, or other closed, impermeable bags, or other closed, impermeable containers, and labeled in accordance with paragraph (g) of this section.

(e) METHOD OF MEASUREMENT

All determinations of airborne concentrations of asbestos fibers shall be made by the membrane filter method at 400-450 x (magnification) (4 millimeter objective) with phase contrast illumination.

(f) MONITORING

(1) Initial determinations. Within 6 months of the publication of this section, every employer shall cause every place of employment where asbestos fibers are released to be monitoried in such a way as to determine whether every employee's exposure to asbestos fibers is below the limits prescribed in paragraph (b) of this section. If the limits are exceeded, the employer shall immediately undertake a compliance program in accordance with paragraph (c) of this section.

(2) Personal Monitoring

(i) Samples shall be collected from within the breathing zone of the employees, on membrane filters of 0.8 micrometer porosity mounted in an open-face filter holder. Samples shall be taken for the determination of the 8-hour, time-weighted average airborne concentrations and of the ceiling concentrations of asbestos fibers.

(ii) Sampling frequency and patterns. After the initial determinations required by subparagraph (1) of this paragraph, samples shall be of such frequency and pattern as to represent with reasonable accuracy the levels of exposure of employees. In no case shall the sampling be done at intervals greater than 6 months for employees whose exposure to asbestos may reasonably be foreseen to exceed the limits prescribed by paragraph (b) of this section.

(3) Environmental monitoring

(i) Samples shall be collected from areas of a work environment which are representative of the airborne concentrations of asbestos fibers which may reach the breathing zone of employees. Samples shall be collected on a membrane filter of 0.8 micrometer porosity mounted in an open-face filter holder. Samples shall be taken for the determination of the 8-hour, time-weighted average airborne concentrations and of the ceiling concentrations of asbestos fibers.

(ii) Sampling frequency and patterns. After the initial determinations required by subparagraph (1) of this paragraph, samples shall be of such frequency and pattern as to represent with reasonable accuracy the levels of exposure of the employees. In no case shall sampling be at intervals greater than 6 months for employees whose exposures to asbestos may reasonably be foreseen to exceed the exposure limits prescribed in paragraph (b) of this section.

(4) Employee observation of monitoring. Affected employees, or their representatives, shall be given a reasonable opportunity to observe any monitoring required by this paragraph and shall have access to the records thereof.

(g) CAUTION SIGNS AND LABELS

(1) Caution Signs

(i) Posting. Caution signs shall be provided and displayed at each location where airborne concentrations of asbestos fibers may be in excess of the exposure limits prescribed in paragraph (b) of this section. Signs shall be posted at such a distance from such a location so that an employee may read the signs and take necessary protective steps before entering the area marked by the signs. Signs shall be posted at all approaches to areas containing excessive concentrations of airborne asbestos fibers.

(ii) Sign specifications. The warning signs required by subdivision (i) of this subparagraph shall conform to the requirements of 20" x 14" vertical format signs specified in Section 1910.145(d)(4), and to this subdivision. The signs shall display the following legend in the lower panel, with letter sizes and styles of a visibility at least equal to that specified in this subdivision.

LEGEND

| | NOTATION |
|---|---|
| Asbestos | 1" Sans Serif, Gothic or Block |
| Dust Hazard | 3/4" Sans Serif, Gothic or Block |
| Avoid Breathing Dust | 1/4" Gothic |
| Wear Assigned Protective Equipment | 1/4" Gothic |
| Do Not Remain in Area Unless Your Work Requires It | 1/4" Gothic |
| Breathing Asbestos Dust May be Hazardous to Your Health | 14 Point Gothic |

Spacing between lines shall be at least equal to the height of the upper of any two lines.

(2) Caution Labels

(i) Labeling. Caution labels shall be affixed to all raw materials, mixtures, scrap, waste, debris, and other products containing asbestos fibers, or to their containers, except that no label is required where asbestos fibers have been modified by a bonding agent, coating, binder, or other material so that during any reasonably foreseeable use, handling, storage, disposal, processing, or transportation, no airborne concentrations of asbestos fibers in excess of the exposure limits prescribed in paragraph (b) of this section will be released.

(ii) Label specifications. The caution labels required by subdivision (i) of this subparagraph shall be printed in letters of sufficient size and contrast as to be readily visible and legible. The label shall state:

CAUTION
Contains Asbestos Fibers
Avoid creating Dust
Breathing Asbestos Dust May Cause
Serious Bodily Harm

(h) HOUSEKEEPING

(1) Cleaning. All external surfaces in any place of employment shall be maintained free of accumulations of asbestos fibers if, with their dispersion, there would be an excessive concentration.

(2) Waste disposal. Asbestos waste, scrap, debris, bags, containers, equipment, and asbestos-contaminated clothing, consigned for disposal, which may produce in any reasonably foreseeable use, handling, storage, processing, disposal or transportation airborne concentrations of asbestos fibers in excess of the exposure limits prescribed in paragraph (b) of this section shall be collected and disposed of in sealed impermeable bags, or other closed, impermeable containers.

(i) Recordkeeping

(1) Exposure records. Every employer shall maintain records of any personal or environmental monitoring required by this section. Records shall be maintained for a period of at least 20 years and shall be made available upon request to the Assistant Secretary of Labor for Occupational Safety and Health, the Director of the National Institute for Occupational Safety and Health, and to authorized representatives of either.

(2) Employee access. Every employee and former employee shall have reasonable access to any record required to be maintained by subparagraph (1) of this paragraph, which indicates the employee's own exposure to asbestos fibers.

(3) Employee notification. Any employee found to have been exposed at any time to airborne concentrations of asbestos fibers in excess of the limits prescribed in paragraph (b) of this section shall be notified in writing of the exposure as soon as practicable but not later than 5 days of the finding. The employee shall also be timely notified of the corrective action being taken.

(j) MEDICAL EXAMINATIONS

(1) General. The employer shall provide or make available at his cost, medical examinations relative to exposure to asbestos required by this paragraph.

(2) Preplacement. The employer shall provide or make available to each of his employees, within 30 calendar days following his first employment in an occupation exposed to airborne concentrations of asbestos fibers, a comprehensive medical examination, which shall include, as a minimum, a chest roentgenogram (posterior-anterior 14 x 17 inches), a history to elicit symptomatology of respiratory disease, and pulmonary function tests to include forced vital capacity (FVC) and forced expiratory volume at 1 second (FEV 1.0).

(3) Annual examinations. On or before January 31, 1973, and at least annually thereafter, every employer shall provide, or make available, comprehensive medical examinations to each of his employees engaged in occupations exposed to airborne concentrations of asbestos fibers. Such annual examination shall include, as a minimum, a chest roentgenogram (posterior-anterior 14 x 17 inches), history to elicit symptomatology of respiratory disease, and pulmonary function tests to include forced vital capacity (FVC) and forced expiratory volume at 1 second (FEV 1.0).

(4) Termination of employment. The employer shall provide, or make available, within 30 calendar days before or after the termination of employment of any employee engaged in an occupation exposed to airborne concentrations of asbestos fibers, a comprehensive medical examination which shall include, as a minimum, a chest roentgenogram (posterior-anterior 14 x 17 inches), a history to elicit symptomatology of respiratory disease, and pulmonary function tests to include forced vital capacity (FVC) and forced expiratory volume at 1 second (FEV 1.0).

(5) Recent examinations. No medical examination is required of any employee, if adequate records show that the employee has been examined in accordance with this paragraph within the past 1-year period.

(6) Medical records.

(i) Maintenance. Employers of employees examined pursuant to this paragraph shall cause to be maintained complete and accurate records of all such medical examinations. Records shall be retained by employers for at least 20 years.

(ii) Access. Records of the medical examinations required by this paragraph shall be provided upon request to employees, designated representatives, and the Assistant Secretary in accordance with 29 CFR 1910.20(a)-(e) and (g)-(i). These records shall also be provided upon the request to the Director of NIOSH. Any physician who conducts a medical examination required by this paragraph shall furnish to the employer of the examined employee all the information specifically required by this paragraph, and any other medical information related to occupational exposure to asbestos fibers.

## Subpart B—National Emission Standard for Asbestos

### § 61.20 Applicability.

The provisions of this subpart are applicable to those sources specified in § 61.22.

### § 61.21 Definitions.

Terms used in this subpart are defined in the act, in subpart A of this part, or in this section as follows:

(a) "Asbestos" means actinolite, amosite, anthophyllite, chrysotile, crocidolite, tremolite.

(b) "Asbestos material" means asbestos or any material containing asbestos.

(c) "Particulate asbestos material" means finely divided particles of asbestos material.

(d) "Asbestos tailings" means any solid waste product of asbestos mining or milling operations which contains asbestos.

(e) "Outside air" means the air outside buildings and structures.

(f) "Visible emissions" means any emissions which are visually detectable without the aid of instruments and which contain particulate asbestos material.

(g) "Asbestos mill" means any facility engaged in the conversion or any intermediate step in the conversion of asbestos ore into commercial asbestos. Outside storage of asbestos materials is not considered a part of such facility.

(h) "Commercial asbestos" means any variety of asbestos which is produced by extracting asbestos from asbestos ore.

(i) "Manufacturing" means the combining of commercial asbestos, or in the case of woven friction products the combining of textiles containing commercial asbestos, with any other material(s), including commercial asbestos, and the processing of this combination into a product as specified in § 61.22(c).

(j) "Demolition" means the wrecking or taking out of any load-supporting structural member and any related removing or stripping of friable asbestos materials.

(k) "Friable asbestos material" means any material that contains more than 1 percent asbestos by weight and that can be crumbled, pulverized, or reduced to powder, when dry, by hand pressure.

(l) "Control device asbestos waste" means any asbestos-containing waste material that is collected in a pollution control device.

(m) "Renovation" means the removing or stripping of friable asbestos materials used on any pipe, duct, boiler, tank, reactor, turbine, furnace, or structural member. Operations in which load-supporting structural members are wrecked or taken out are excluded.

[Paragraph (m) revised by 43 FR 26373, June 19, 1978]

(n) "Planned renovation" means a renovation operation, or a number of such operations, in which the amount of friable asbestos material that will be removed or stripped within a given period of time can be predicted. Operations that are individually non-scheduled are included, provided a number of such operations can be predicted to occur during a given period of time based on operating experience.

(o) "Emergency renovation" means a renovation operation that results from a sudden, unexpected event, and is not a planned renovation. Operations necessitated by non-routine failures of equipment are included.

(p) "Adequately wetted" means sufficiently mixed or coated with water or an aqueous solution to prevent dust emissions.

(q) "Removing" means taking out friable asbestos materials used on any pipe, duct, boiler, tank, reactor, turbine, furnace, or structural member from any building, structure, facility, or installation.

(r) "Stripping" means taking off friable asbestos materials from any pipe, duct, boiler, tank, reactor, turbine, furnace, or structural member.

[Paragraph (q) and (r) revised by 43 FR 26373, June 19, 1978]

(s) "Fabricating" means any processing of a manufactured product containing commercial asbestos, with the exception of processing at temporary sites for the construction or restoration of buildings, structures, facilities or installations.

(t) "Inactive waste disposal site" means any disposal site or portion thereof where additional asbestos-containing waste material will not be deposited and where the surface is not disturbed by vehicular traffic.

(u) "Active waste disposal site" means any disposal site other than an inactive site.

(v) "Roadways" means surfaces on which motor vehicles travel including, but not limited to, highways, roads, streets, parking areas, and driveways.

(w) "Asbestos-containing waste material" means any waste which contains commercial asbestos and is generated by a source subject to the provisions of this subpart, including asbestos mill tailings, control device asbestos waste, friable asbestos waste material, and bags or containers that previously contained commercial asbestos.

[40 FR 48292, October 14, 1975]

(x) "Structural member" means any load-supporting member, such as beams and load-supporting walls; or any non-load-supporting member, such as ceilings and non-load-supporting walls.

[42 FR 12127, March 2, 1977]

### 61.22 Emission standard.

(a) Asbestos mills: There shall be no visible emissions to the outside air from any asbestos mill except as provided in paragraph (f) of this section.

[39 FR 15936, May 3, 1974]

(b) Roadways: The surfacing of roadways with asbestos tailings or with asbestos-containing waste that is generated by any source subject to paragraphs (c), (d), (e) or (h), of this section is prohibited, except for temporary roadways on an area of asbestos ore deposits. The deposition of asbestos tailings or asbestos-containing waste on roadways covered with snow or ice is considered "surfacing."

(c) Manufacturing: There shall be no visible emissions to the outside air, except as provided in paragraph (f) of this section, from any of the following operations if they use commercial asbestos or from any building or structure in which such operations are conducted.

[40 FR 48292, October 14, 1975]

(1) The manufacture of cloth, cord, wicks, tubing, tape, twine, rope, thread, yarn, roving, lap, or other textile materials.

(2) The manufacture of cement products.

(3) The manufacture of fireproofing and insulating materials.

(4) The manufacture of friction products.

(5) The manufacture of paper, millboard, and felt.

(6) The manufacture of floor tile.

(7) The manufacture of paints, coatings, caulks, adhesives, sealants.

(8) The manufacture of plastics and rubber materials.

(9) The manufacture of chlorine.

(10) The manufacture of shotgun shells.

(11) The manufacture of asphalt concrete.

(d) *Demolition and renovation.* The requirements of this paragraph shall apply to any owner or operator of a demolition or renovation operation who intends to demolish any institutional, commercial, or industrial building (including apartment buildings having more than four dwelling units), structure, facility, installation, or portion thereof which contains any pipe, duct, boiler, tank, reactor, turbine, furnace, or structural member that is covered or coated with friable asbestos materials, except as provided in paragraph (d)(1) of this section; or who intends to renovate any institutional, commercial, or industrial building, structure, facility, installation, or portion thereof where more than 80 meters (ca. 260 feet) of pipe covered or coated with friable asbestos materials are stripped or removed, or more than 15 square meters, (ca. 160 square feet) of friable asbestos materials used to cover or coat any duct, boiler, tank, reactor, turbine, furnace, or structural member are stripped or removed.

(1) (i) The owner or operator of a demolition operation is exempted from the requirements of this paragraph: *Provided,* (A) The amount of friable asbestos materials in the building or portion thereof to be demolished is less than 80 meters (ca. 260 feet) used on pipes, and less than 15 square meters (ca. 160 square feet) used on any duct, boiler, tank, reactor, turbine, furnace, or structural member, and (B) the notification requirements of paragraph (d)(1)(ii) are met.

(ii) Written notification shall be postmarked or delivered to the Administrator at least 20 days prior to com-

mencement of demolition and shall include the information required by paragraph (d)(2) of this section, with the exception of the information required by paragraphs (d)(2)(iii), (vi), (vii), (viii), and (ix) of this section, and shall state the measured or estimated amount of friable asbestos materials which is present. Techniques of estimation shall be explained.

[Paragraph (d) revised by 43 FR 26374, June 19, 1978]

(2) Written notice of intention to demolish or renovate shall be provided to the Administrator by the owner or operator of the demolition or renovation operation. Such notice shall be postmarked or delivered to the Administrator at least 10 days prior to commencement of demolition, or as early as possible prior to commencement of emergency demolition subject to paragraph (d)(6) of this section, and as early as possible prior to commencement of renovation. Such notice shall include the following information:

(i) Name of owner or operator.

(ii) Address of owner or operator.

(iii) Description of the building, structure, facility, or installation to be demolished or renovated, including the size, age, and prior use of the structure, and the approximate amount of friable asbestos materials present.

[Paragraph (iii) revised by 43 FR 26374, June 19, 1978]

(iv) Address or location of the building, structure, facility, or installation.

(v) Scheduled starting and completion dates of demolition or renovation.

(vi) Nature of planned demolition or renovation and method(s) to be employed.

(vii) Procedures to be employed to meet the requirements of this paragraph and paragraph (j) of this section.

(viii) The name and address or location of the waste disposal site where the friable asbestos waste will be deposited.

(ix) Name, title, and authority of the State or local governmental representative who has ordered a demolition which is subject to paragraph (d)(6) of this section.

(3)(i) For purposes of determining whether a planned renovating operation constitutes a renovation within the meaning of this paragraph, the amount of friable asbestos material to be removed or stripped shall be:

(A) For planned renovating operations involving individually non-scheduled operations, the additive amount of friable asbestos material that can be predicted will be removed or stripped at a source over the maximum period of time for which a prediction can be made. The period shall be not less than 30 days and not longer than one year.

(B) For each planned renovating operation not covered by paragraph (d)(3)(i)(A), the total amount of friable asbestos material that can be predicted will be removed or stripped at a source.

(ii) For purposes of determining whether an emergency renovating operation constitutes a renovation within the meaning of this paragraph, the amount of friable asbestos material to be removed or stripped shall be the total amount of friable asbestos material that will be removed or stripped as a result of the sudden, unexpected event that necessitated the renovation.

(4) The following procedures shall be used to prevent emissions of particulate asbestos material to outside air:

(i) Friable asbestos materials, used on any pipe, duct, boiler, tank, reactor, turbine, furnace, or structural member, shall be removed from any building, structure, facility or installation subject to this paragraph. Such removal shall occur before wrecking or dismantling of any portion of such building, structure, facility, or installation that would break up the friable asbestos materials and before wrecking or dismantling of any other portion of such building, structure, facility, or installation, that would preclude access to such materials for subsequent removal. Removal of friable asbestos materials used on any pipe, duct, or structural member which are encased in concrete or other similar structural material is not required prior to demolition, but such materials shall be adequately wetted whenever exposed during demolition.

(ii) Friable asbestos materials used on pipes, ducts, boilers, tanks, reactors, turbines, furnaces, or structural members shall be adequately wetted during stripping, except as provided in paragraphs (d)(4)(iv), (d)(4)(vi), or (d)(vii) of this section.

(iii) Pipes, ducts, boilers, tanks, reactors, turbines, furnaces, or structural members that are covered or coated with friable asbestos materials may be taken out of any building, structure, facility, or installation subject to this paragraph as units or in sections provided the friable asbestos materials exposed during cutting or disjoining are adequately wetted during the cutting or disjoining operation. Such units shall not be dropped or thrown to the ground, but shall be carefully lowered to ground level.

(iv) The stripping of friable asbestos materials used on any pipe, duct, boiler, tank, reactor, turbine, furnace, or structural member that has been removed as a unit or in sections as provided in paragraph (d)(4)(iii) of this section shall be performed in accordance with paragraph (d)(4)(ii) of this section. Rather than comply with the wetting requirement, a local exhaust ventilation and collection system may be used to prevent emissions to the outside air. Such local exhaust ventilation systems shall be designed and operated to capture the asbestos particulate matter produced by the stripping of friable asbestos materials. There shall be no visible emissions to the outside air from such local exhaust ventilation and collection systems except as provided in paragraph (f) of this section.

[4(i)-(iv) revised by 43 FR 26374, June 19, 1978]

(v) All friable asbestos materials that have been removed or stripped shall be adequately wetted to ensure that such materials remain wet during all remaining stages of demolition or renovation and related handling operations. Such materials shall not be dropped or thrown to the ground or a lower floor. Such materials that have been removed or stripped more than 50 feet above ground level, except those materials removed as units or in sections, shall be transported to the ground via dust-tight chutes or containers.

(vi) Except as specified below, the wetting requirements of this paragraph are suspended when the temperature at the point of wetting is below 0°C (32°F). When friable asbestos materials are not wetted due to freezing temperatures, such materials on pipes, ducts, boilers, tanks, reactors, turbines, furnaces, or structural members shall, to the maximum extent possible, be removed as units or in sections prior to wrecking. In no case shall the requirements of paragraphs (d)(4)(iv) or (d)(4)(v) be suspended due to freezing temperatures.

(vii) For renovation operations, local exhaust ventilation and collection systems may be used, instead of wetting as specified in paragraph (d)(4)(ii), to prevent emissions of particulate asbestos material to outside air when damage to equipment resulting from the wetting would be unavoidable. Upon request and supply of adequate information, the Administrator will determine whether damage to equipment resulting from wetting to comply with the provisions of this paragraph would be unavoidable. Such local exhaust ventilation systems shall be designed and operated to capture the asbestos particulate matter produced by the stripping and removal of friable asbestos material. There shall be no visible emissions to the outside air from such local exhaust ventilation and collection systems, except as provided in paragraph (f) of this section.

(5) Sources subject to this paragraph are exempt from the requirements of §§ 61.05(a), 61.07, and 61.09.

(6) The demolition of a building, structure, facility, or installation, pursuant to an order of an authorized representative of a State or local governmental agency, issued because that building is structurally unsound and in danger of imminent collapse is exempt from all but the following requirements of paragraph (d) of this section:

(i) The notification requirements specified by paragraph (d)(2) of this section;

(ii) The requirements on stripping of friable asbestos materials from previously removed units or sections as specified in paragraph (d)(4)(iv) of this section;

(iii) The wetting, as specified by paragraph (d)(4)(v) of this section, of friable asbestos materials that have been removed or stripped;

(iv) The portion of the structure being demolished that contains friable asbestos materials shall be adequately wetted during the wrecking operation.

[39 FR 15936, May 3, 1974; 40 FR 48292, October 14, 1975]

(e) *Spraying.* There shall be no visible emissions to the outside air from the spray-on application of materials containing more than 1 percent asbes-

[Sec. 61.22(e)]

tos, on a dry weight basis, used on equipment and machinery, except as provided in paragraph (f) of this section. Materials sprayed on buildings, structures, structural members, pipes, and conduits shall contain less than 1 percent asbestos on a dry weight basis.

[Paragraph (e) revised by 43 FR 26374, June 19, 1978]

(1) Sources subject to this paragraph are exempt from the requirements of § 61.05(a), § 61.07, and § 61.09.

(2) Any owner or operator who intends to spray asbestos materials which contain more than 1 percent asbestos on a dry weight basis on equipment and machinery shall report such intention to the Administrator at least 20 days prior to the commencement of the spraying operation. Such report shall include the following information:

(i) Name of owner or operator.

(ii) Address of owner or operator.

(iii) Location of spraying operation.

(iv) Procedures to be followed to meet the requirements of this paragraph.

(3) The spray-on application of materials in which the asbestos fibers are encapsulated with a bituminous or resinous binder during spraying and which are not friable after drying is exempted from the requirements of paragraphs (e) and (e)(2) of this section.

[Paragraphs (2) and (3) revised by 43 FR 26374, June 19, 1978]

(f) Rather than meet the no-visible-emission requirements as specified by paragraphs (a), (c), (d), (e), (h), (j), and (k) of this section, an owner or operator may elect to use the methods specified by § 61.23 to clean emissions containing particulate asbestos material before such emissions escape to, or are vented to, the outside air.

(g) Where the presence of uncombined water is the sole reason for failure to meet the no-visible-emission requirement of paragraphs (a), (c), (d), (e), (h), (j), or (k) of this section, such failure shall not be a violation of such emission requirements.

(h) Fabricating: There shall be no visible emissions to the outside air, except as provided in paragraph (f) of this section, from any of the following operations if they use commercial asbestos or from any building or structure in which such operations are conducted.

(1) The fabrication of cement building products.

(2) The fabrication of friction products, except those operations that primarily install asbestos friction materials on motor vehicles.

(3) The fabrication of cement or silicate board for ventilation hoods; ovens; electrical panels; laboratory furniture; bulkheads, partitions and ceilings for marine construction; and flow control devices for the molten metal industry.

(i) Insulating: Molded insulating materials which are friable and wet-applied insulating materials which are friable after drying, installed after the effective date of these regulations, shall contain no commercial asbestos. The provisions of this paragraph do not apply to insulating materials which are spray applied; such materials are regulated under § 61.22(e).

(j) Waste disposal for manufacturing, fabricating, demolition, renovation and spraying operations: The owner or operator of any source covered under the provisions of paragraphs (c), (d), (e), or (h) of this section shall meet the following standards:

(1) There shall be no visible emissions to the outside air, except as provided in paragraph (j)(3) of this section, during the collection; processing, including incineration; packaging; transporting; or deposition of any asbestos-containing waste material which is generated by such source.

(2) All asbestos-containing waste material shall be deposited at waste disposal sites which are operated in accordance with the provisions of § 61.25.

(3) Rather than meet the requirement of paragraph (j)(1) of this section, an owner or operator may elect to use either of the disposal methods specified under (j)(3)(i) and (ii) of this section, or an alternative disposal method which has received prior approval by the Administrator:

(i) Treatment of asbestos-containing waste material with water:

(A) Control device asbestos waste shall be thoroughly mixed with water into a slurry and other asbestos-containing waste material shall be adequately wetted. There shall be no visible emissions to the outside air from the collection, mixing and wetting operations, except as provided in paragraph (f) of this section.

(B) After wetting, all asbestos-containing waste material shall be sealed into leak-tight containers while wet, and such containers shall be deposited at waste disposal sites which are operated in accordance with the provisions of § 61.25.

(C) The containers specified under paragraph (j)(3)(i)(B) of this section shall be labeled with a warning label that states:

CAUTION
Contains Asbestos
Avoid Opening or Breaking Container
Breathing Asbestos is Hazardous
to Your Health

Alternatively, warning labels specified by Occupational Safety and Health Standards of the Department of Labor, Occupational Safety and Health Administration (OSHA) under 29 CFR 1910.-93a(g)(2)(ii) may be used.

(ii) Processing of asbestos-containing waste material into non-friable forms:

(A) All asbestos-containing waste material shall be formed into non-friable pellets or other shapes and deposited at waste disposal sites which are operated in accordance with the provisions of § 61.25.

(B) There shall be no visible emissions to the outside air from the collection and processing of asbestos-containing waste material, except as specified in paragraph (f) of this section.

(4) For the purposes of this paragraph (j), the term all asbestos-containing waste material as applied to demolition and renovation operations covered by paragraph (d) of this section includes only friable asbestos waste and control device asbestos waste.

(k) Waste disposal for asbestos mills: The owner or operator of any source covered under the provisions of paragraph (a) of this section shall meet the following standard:

(1) There shall be no visible emissions to the outside air, except as provided in paragraph (k)(3) of this section, during the collection, processing, packaging, transporting or deposition of any asbestos-containing waste material which is generated by such source.

(2) All asbestos-containing waste material shall be deposited at waste disposal sites which are operated in accordance with the provisions of § 61.25.

(3) Rather than meet the requirement of paragraph (k)(1) of this section, an owner or operator may elect to meet the following requirements in paragraphs (k)(3)(i) and (ii), or use an alternative disposal method which has received prior approval by the Administrator:

(i) There shall be no visible emissions to the outside air from the transfer of control device asbestos waste to the tailings conveyor, except as provided in paragraph (f) of this section. Such waste shall be subsequently processed either as specified in paragraph (k)(3)(ii) of this section or as specified in paragraph (j)(3) of this section.

(ii) All asbestos-containing waste material shall be adequately mixed, with a wetting agent recommended by the manufacturer of the agent to effectively wet dust and tailings, prior to deposition at a waste disposal site. Such agent shall be used as recommended for the particular dust by the manufacturer of the agent. There shall be no discharge of visible emissions to the outside air from the wetting operation except as specified in paragraph (f) of this section. Wetting may be suspended when the ambient temperature at the waste disposal site is less than −9.5°C (ca. 15°F). The ambient air temperature shall be determined by an appropriate measurement method with an accuracy of ±1°C (±2°F) and recorded at least at hourly intervals during the period that the operation of the wetting system is suspended. Records of

such temperature measurements shall be retained at the source for a minimum of two years and made available for inspection by the Administrator.

(i) The owner of any inactive waste disposal site, which was operated by sources covered under § 61.22 (a), (c) or (h) and where asbestos-containing waste material produced by such sources was deposited, shall meet the following standards:

(1) There shall be no visible emissions to the outside air from an inactive waste disposal site subject to this paragraph, except as provided in paragraph (i)(5) of this section.

(2) Warning signs shall be displayed at all entrances, and along the property line of the site or along the perimeter of the sections of the site where asbestos-containing waste material was deposited, at intervals of 100 m (ca. 330 ft) or less, except as specified in paragraph (i)(4) of this section. Signs shall be posted in such a manner and location that a person may easily read the legend. The warning signs required by this paragraph shall conform to the requirements of 20" x 14" upright format signs specified in 29 CFR 1910.145(d)(4) and this paragraph. The signs shall display the following legend in the lower panel, with letter sizes and styles of a visibility at least equal to those specified in this paragraph.

LEGEND

ASBESTOS WASTE DISPOSAL SITE

Do Not Create Dust

Breathing Asbestos is Hazardous to Your Health

Notation

1" Sans Serif, Gothic or Block

¼" Sans Serif, Gothic or Block

14 Point Gothic

Spacing between lines shall be at least equal to the height of the upper of the two lines.

(3) The perimeter of the site shall be fenced in a manner adequate to deter access by the general public, except as specified in paragraph (i)(4) of this section.

(4) Warning signs and fencing are not required where the requirements of paragraphs (i)(5) (i) or (ii) of this section are met, or where a natural barrier adequately deters access by the general public. Upon request and supply of appropriate information, the Administrator will determine whether a fence or a natural barrier adequately deters access to the general public.

(5) Rather than meet the requirement of paragraph (i)(1) of this section, an owner may elect to meet the requirements of this paragraph or may use an alternative control method for emissions from inactive waste disposal sites which has received prior approval by the Administrator.

(i) The asbestos-containing waste material shall be covered with at least 15 centimeters (ca. 6 inches) of compacted non-asbestos-containing material, and a cover of vegetation shall be grown and maintained on the area adequate to prevent exposure of the asbestos-containing waste material; or

(ii) The asbestos-containing waste material shall be covered with at least 60 centimeters (ca. 2 feet) of compacted non-asbestos-containing material and maintained to prevent exposure of the asbestos-containing waste; or

(iii) For inactive waste disposal sites for asbestos tailings, a resinous or petroleum-based dust suppression agent which effectively binds dust and controls wind erosion shall be applied. Such agent shall be used as recommended for the particular asbestos tailings by the dust suppression agent manufacturer. Other equally effective dust suppression agents may be used upon prior approval by the Administrator. For purposes of this paragraph, waste crankcase oil is not considered a dust suppression agent.

[40 FR 48292, October 14, 1975]

### § 61.23 Air-cleaning.

If air-cleaning is elected, as permitted by §§ 61.22(f) and 61.22(d)(4)(iv), the requirements of this section must be met.

[40 FR 48292, October 14, 1975]

(a) Fabric filter collection devices must be used, except as noted in paragraphs (b) and (c) of this section. Such devices must be operated at a pressure drop of no more than 4 inches water gage, as measured across the filter fabric. The airflow permeability, as determined by ASTM method D737-69, must not exceed 30 $ft^3/min/ft^2$ for woven fabrics or 35 $ft^3/min/ft^2$ for felted fabrics, except that 40 $ft^3/min/ft^2$ for woven and 45 $ft^3/min/ft^2$ for felted fabrics is allowed for filtering air from asbestos ore dryers. Each square yard of felted fabric must weigh at least 14 ounces and be at least one-sixteenth inch thick throughout. Synthetic fabrics must not contain fill yarn other than that which is spun.

(b) If the use of fabric filters creates a fire or explosion hazard, the administrator may authorize the use of wet collectors designed to operate with a unit contacting energy of at least 40 inches water gage pressure.

(c) The administrator may authorize the use of filtering equipment other than that described in paragraphs (a) and (b) of this section if the owner or operator demonstrates to the satisfaction of the administrator that the filtering of particulate asbestos material is equivalent to that of the described equipment.

(d) All air-cleaning equipment authorized by this section must be properly installed, used, operated, and maintained. Bypass devices may be used only during upset or emergency conditions and then only for so long as it takes to shut down the operation generating the particulate asbestos material.

### § 61.24 Reporting.

The owner or operator of any existing source to which this subpart is applicable shall, within 90 days after the effective date, provide the following information to the administrator:

(a) A description of the emission control equipment used for each process;

(b) If a fabric filter device is used to control emissions, the pressure drop across the fabric filter in inches water gage.

(1) If the fabric filter device utilizes a woven fabric, the airflow permeability in $ft^3/min/ft^2$; and, if the fabric is synthetic, indicate whether the fill yarn is spun or not spun.

(2) If the fabric filter device utilizes a felted fabric, the density in $oz/yd^2$, the minimum thickness in inches, and the airflow permeability in $ft^3/min/ft^2$.

(c) For sources subject to §§ 61.22(j) and 61.22(k):

(1) A brief description of each process that generates asbestos-containing waste material.

(2) The average weight of asbestos-containing waste material disposed of, measured in kg/day.

(3) The emission control methods used in all stages of waste disposal.

(4) The type of disposal site or incineration site used for ultimate disposal, the name of the site operator, and the name and location of the disposal site.

(d) For sources subject to § 61.22(l):

(1) A brief description of the site.

(2) The method or methods used to comply with the standard, or alternative procedures to be used.

(e) Such information shall accompany the information required by § 61.10. The information described in this section shall be reported using the format of Appendix A of this part.

[40 FR 48292, October 14, 1975]

### § 61.25 Waste disposal sites.

In order to be an acceptable site for disposal of asbestos-containing waste material under § 61.22 (j) and (k), an active waste disposal site shall meet the requirements of this section.

(a) There shall be no visible emissions to the outside air from any active waste disposal site where asbestos-containing waste material has been deposited, except as provided in paragraph (e) of this section.

(b) Warning signs shall be displayed at all entrances, and along the property line of the site or along the perimeter of the sections of the site where asbestos-containing waste material is deposited, at intervals of 100 m (ca. 330 ft) or less except as specified in paragraph (d) of this section. Signs shall be posted in such

[Sec. 61.25(b)]

a manner and location that a person may easily read the legend. The warning signs required by this paragraph shall conform to the requirements of 20" x 14" upright format signs specified in 29 CFR 1910.145(d)(4) and this paragraph. The signs shall display the following legend in the lower panel, with letter sizes and styles of a visibility at least equal to those specified in this paragraph.

LEGEND

ASBESTOS WASTE DISPOSAL SITE

Do Not Create Dust

Breathing Asbestos
Is Hazardous to Your Health

Notation

1" Sans Serif, Gothic or Block

¾" Sans Serif, Gothic or Block

14 Point Gothic

Spacing between lines shall be at least equal to the height of the upper of the two lines.

(c) The perimeter of the disposal site shall be fenced in order to adequately deter access to the general public except as specified in paragraph (d) of this section.

(d) Warning signs and fencing are not required where the requirements of paragraph (e)(1) of this section are met, or where a natural barrier adequately deters access to the general public. Upon request and supply of appropriate information, the Administrator will determine whether a fence or a natural barrier adequately deters access to the general public.

(e) Rather than meet the requirement of paragraph (a) of this section, an owner or operator may elect to meet the requirements of paragraph (e)(1) or (e)(2) of this section, or may use an alternative control method for emissions from active waste disposal sites which has received prior approval by the Administrator.

(1) At the end of each operating day, or at least once every 24-hour period while the site is in continuous operation, the asbestos-containing waste material which was deposited at the site during the operating day or previous 24-hour period shall be covered with at least 15 centimeters (ca. 6 inches) of compacted non-asbestos-containing material.

(2) At the end of each operating day, or at least once every 24-hour period while the disposal site is in continuous operation, the asbestos-containing waste material which was deposited at the site during the operating day or previous 24-hour period shall be covered with a resinous or petroleum-based dust suppression agent which effectively binds dust and controls wind erosion. Such agent shall be used as recommended for the particular dust by the dust suppression agent manufacturer. Other equally effective dust suppression agents may be used upon prior approval by the Administrator. For purposes of this paragraph, waste crankcase oil is not considered a dust suppression agent.

[40 FR 48292, October 14, 1975]

(Sec. 114 of the Clean Air Act as amended (42 U.S.C. 7414))

## Subpart C—National Emission Standard for Beryllium

### § 61.30 Applicability.

The provisions of this subpart are applicable to the following stationary sources:

(a) Extraction plans, ceramic plants, foundries, incinerators, and propellant plants which process beryllium ore, beryllium, beryllium oxide, beryllium alloys, or beryllium-containing waste.

(b) Machine shops which process beryllium, beryllium oxides, or any alloy when such alloy contains more than 5 percent beryllium by weight.

### § 61.31 Definitions.

Terms used in this subpart are defined in the act, in subpart A of this part, or in this section as follows:

(a) "Beryllium" means the element beryllium. Where weights or concentrations are specified, such weights or concentrations apply to beryllium only, excluding the weight or concentration of any associated elements.

(b) "Extraction plant" means a facility chemically processing beryllium ore to beryllium metal, alloy, or oxide, or performing any of the intermediate steps in these processes.

(c) "Beryllium ore" means any naturally occurring material mined or gathered for its beryllium content.

(d) "Machine shop" means a facility performing cutting, grinding, turning, honing, milling, deburring, lapping, electrochemical machining, etching, or other similar operations.

(e) "Ceramic plant" means a manufacturing plant producing ceramic items.

(f) "Foundry" means a facility engaged in the melting or casting of beryllium metal or alloy.

(g) "Beryllium-containing waste" means material contaminated with beryllium and/or beryllium compounds used or generated during any process or operation performed by a source subject to this subpart.

(h) "Incinerator" means any furnace used in the process of burning waste for the primary purpose of reducing the volume of the waste by removing combustible matter.

(i) "Propellant" means a fuel and oxidizer physically or chemically combined which undergoes combustion to provide rocket propulsion.

(j) "Beryllium alloy" means any metal to which beryllium has been added in order to increase its beryllium content and which contains more than 0.1 percent beryllium by weight.

(k) "Propellant plant" means any facility engaged in the mixing, casting, or machining of propellant.

### § 61.32 Emission standard.

(a) Emissions to the atmosphere from stationary sources subject to the provisions of this subpart shall not exceed 10 grams of beryllium over a 24-hour period, except as provided in paragraph (b) of this section.

(b) Rather than meet the requirement of paragraph (a) of this section, an owner or operator may request approval from the Administrator to meet an ambient concentration limit on beryllium in the vicinity of the stationary source of 0.01 $\mu g/m^3$, averaged over a 30-day period.

(1) Approval of such requests may be granted by the Administrator provided that:

(i) At least 3 years of data is available which in the judgment of the Administrator demonstrates that the future ambient concentrations of beryllium in the vicinity of the stationary source will not exceed 0.01 $\mu g/m^3$, averaged over a 30-day period. Such 3-year period shall be the 3 years ending 30 days before the effective date of this standard.

(ii) The owner or operator requests such approval in writing within 30 days after the effective date of this standard.

(iii) The owner or operator submits a report to the Administrator within 45 days after the effective date of this standard which report includes the following information:

(a) Description of sampling method including the method and frequency of calibration.

(b) Method of sample analysis.

(c) Averaging technique for determining 30-day average concentrations.

(d) Number, identity, and location (address, coordinates, or distance and heading from plant) of sampling sites.

(e) Ground elevations and height above ground of sampling inlets.

(f) Plant and sampling area plots showing emission points and sampling sites. Topographic features significantly affecting dispersion including plant building heights and locations shall be included.

(g) Information necessary for estimating dispersion including stack height, inside diameter, exit gas temperature, exit velocity or flow rate, and beryllium concentration.

(h) A description of data and procedures (methods or models) used to de-